In the Claims

Please replace all prior versions, and listings, of claims in the application with the following listing of claims, including marked-up claims with insertions indicated by underlining and deletions indicated by strikeouts and/or double bracketing:

Listing of the Claims

1. (Currently Amended) A method of classifying ~~a piece of~~ material, wherein a number of potential classifications are available, the method comprising acts of:

(A) detecting x-rays fluoresced from the ~~piece~~ material;

(B) detecting optical emissions emitted from a plasma resulting from a vaporization of a portion of the ~~piece~~material; and

(C) classifying the ~~piece~~ material based on ~~at least one of:~~ the detected x-rays[[,]] and the detected optical emissions, including acts of

(1) reducing the number of potential classifications by analyzing only a first one of two types of emissions: the detected x-rays or the detected optical emissions; and

(2) selecting one of the reduced number of classifications by analyzing only a second one of the two types of emissions that was not analyzed in the act (C)(1).

2. (Currently Amended) The method of claim 1, further comprising an act of:

(D) irradiating the ~~piece~~ material with x-ray photons to cause the material ~~piece~~ to fluoresce the fluoresced x-rays.

3. (Currently Amended) The method of claim 2, further comprising an act of:

(E) vaporizing [[a]] the portion of the material ~~piece~~ to produce [[a]] the plasma that emits the optical emissions.

4. (Currently Amended) The method of claim 3, further comprising an act of:

(F) conveying the ~~piece~~ material into an area in which two or more of the acts (A), (B), (D) and (E) are performed.

5. (Currently Amended) The method of claim 4, further comprising an act of:

(G) conveying the ~~piece~~ material out of the area ~~in which acts (A), (B) (D) and (E) are performed~~.

6. (Currently Amended) The method of claim 5, further comprising an act of:

(H) sorting the ~~piece~~ material based on the classification.

7. (Currently Amended) The method of claim 1, further comprising an act of:

(D) vaporizing [[a]] the portion of the ~~piece~~ to produce [[a]] the plasma that emits the optical emissions.

8. (Currently Amended) The method of claim 7, wherein act (D) includes vaporizing the portion of the ~~piece~~ material using a laser beam.

9. (Currently Amended) The method of claim 7, wherein act (D) includes vaporizing the portion of the ~~piece~~ material using an electrical discharge.

10-12. (Cancelled)

13. (Currently Amended) The method of claim 1, wherein ~~a predetermined number of potential classifications are available, and wherein the act (C) includes acts of~~:

the act (C)(1) includes analyzing only the detected optical emissions ~~to reduce the predetermined number to a reduced number of potential classifications~~; and;

the act (C)(2) includes analyzing only ~~classifying the piece of material as one of the reduced number of classifications based on~~ the detected x-rays.

14. (Currently Amended) The method of claim 13, wherein act (C)(1) includes determining that a threshold percentage of the collected optical emissions were emitted by one or more particular elements included within the ~~piece~~material.

15. (Original) The method of claim 14, wherein at least one of the one or more particular elements is a low-Z element.

16. (Original) The method of claim 15, wherein at least one of the one or more particular elements is aluminum.

17. (Original) The method of claim 13, wherein the reduced number of classifications represent a number of alloys belonging to a same alloy group.

18. (Original) The method of claim 17, wherein the alloy group is an aluminum alloy group.

19. (Currently Amended) The method of claim 1, wherein ~~a predetermined number of potential classifications are available, and wherein the act (C) includes acts of~~:

the act (C)(1) includes analyzing only the detected x-rays ~~to reduce the predetermined number to a reduced number of potential classifications~~; and

the act (C)(2) includes analyzing only ~~classifying the piece of material as one of the reduced number of classifications based on~~ the detected optical emissions.

20. (Original) The method of claim 1, wherein act (C) includes:

(1) creating one or more emissions spectra from the detected x-rays and detected optical emissions; and

(2) estimating peak values for one or more regions of interest of the one or more spectra.

21. (Original) The method of claim 20, wherein act (C)(2) includes applying a shape fitting function to data corresponding to the one or more regions of interest.

22. (Currently Amended) A system for classifying ~~a piece of~~ material, wherein a number of potential classifications are available, comprising:

a classification module to receive x-ray fluorescence information representing x-rays fluoresced from the ~~piece~~material, to receive optical emissions information representing optical

emissions emitted from the ~~piece~~material, and to classify the ~~piece~~ material based on at least one of the x-ray fluorescence information and the optical emissions information, the classifying including reducing the number of potential classifications by analyzing only a first one of two types of emissions: the detected x-rays or the detected optical emissions; and selecting one of the reduced number of classifications by analyzing only a second one of the two types of emissions that was not analyzed in reducing the number of potential classifications.

23. (Currently Amended) The system of claim 22, further comprising:

an x-ray detector to detect the x-rays fluoresced from the material~~piece~~;

an optical emissions collector to detect the optical emissions emitted from the material~~piece~~.

24. (Currently Amended) A system for classifying a piece of material, wherein a number of potential classifications are available, comprising:

one or more inputs to receive x-ray fluorescence information representing x-rays fluoresced from the ~~piece~~ material and optical emissions information representing optical emissions emitted from the ~~piece~~material; and

means for classifying the ~~piece~~ material based on ~~at least one of~~ the x-ray fluorescence information and the optical emissions information including means for reducing the number of potential classifications by analyzing only a first one of two types of emissions: the detected x-rays or the detected optical emissions and means for selecting one of the reduced number of classifications by analyzing only a second one of the two types of emissions that was not analyzed in reducing the number of potential classifications.

25. (Currently Amended) A computer-readable medium having computer-readable signals stored thereon that define instructions that, as a result of being executed by a computer, control the computer to perform a method of classifying ~~a piece of~~ material, wherein a number of potential classifications are available, the method comprising acts of:

(A) detecting x-rays fluoresced from the ~~piece~~ material;

(B) detecting optical emissions emitted from a plasma resulting from a vaporization of a portion of the ~~piece~~material; and

(C) classifying the ~~piece~~ material based on ~~at least one of:~~ the detected x-rays[[,]] and the detected optical emissions, including acts of

(1) reducing the number of potential classifications by analyzing only a first one of two types of emissions: the detected x-rays or the detected optical emissions; and

(2) selecting one of the reduced number of classifications by analyzing only a second one of the two types of emissions that was not analyzed in the act (C)(1).

26. (Currently Amended) The method of claim 5, wherein the act (F) includes conveying the ~~piece~~material on a first conveyor, and the act (G) includes conveying the ~~piece~~material on a second conveyor distinct from the first conveyor.

27. (Currently Amended) The method of claim 26, wherein the act (A) is performed while the ~~piece~~material passes from the first belt to the second belt.

28. (Currently Amended) he method of claim 26, wherein the act (B) is performed while the ~~piece~~material passes from the first belt to the second belt.

29. (Currently Amended) The method of claim 26, wherein the act (D) is performed while the ~~piece~~material passes from the first belt to the second belt.

30. (Currently Amended) The method of claim 26, wherein the act (E) is performed while the ~~piece~~material passes from the first belt to the second belt.

31. (New) The method of claim 15, wherein at least one of the one or more elements is magnesium.

32. (New) The method of claim 15, wherein at least one of the one or more elements is silicon.

33. (New) The method of claim 15, wherein at least one of the one or more elements is carbon.

34. (New) The method of claim 1, wherein at least a portion of the material is in liquid or molten form.

35. (New) The method of claim 1, wherein at least a portion of the material is in solid form.

36. (New) The method of claim 1, wherein the material comprises a plurality of pieces of material in solid form, and the acts (A) – (C) are performed on the plurality of pieces.

37. (New) The method of claim 1, wherein the act (C) comprises identifying a contaminant in the material.

38. (New) A method of classifying material in a moving stream of materials, comprising acts of:

(A) detecting x-rays fluoresced from the material as the material moves;

(B) detecting optical emissions emitted from a plasma resulting from a vaporization of a portion of the material as the material moves; and

(C) classifying the material based on the detected x-rays and/or the detected optical emissions, including

(1) creating one or more emissions spectra from the detected x-rays and detected optical emissions; and

(2) estimating peak values for one or more regions of interest of the one or more spectra.

39. (New) The method of claim 38, wherein the act (C)(2) includes applying a shape-fitting function to data corresponding to the one or more regions of interest.

40. (New) The method of claim 38, further comprising:

(D) based on the classification, sorting the material by removing the material from the stream to a location associated with the classification.

41. (New) The method of claim 38, wherein at least a portion of the material is in liquid or molten form.

42. (New) The method of claim 38, wherein at least a portion of the material is in solid form.

43. (New) The method of claim 38, wherein the material comprises a plurality of pieces of material in solid form, and the acts (A) – (C) are performed on a plurality of pieces.

44. (New) The method of claim 38, where in the act (C) comprises identifying a contaminant in the material.

45. (New) A method of classifying material, the method comprising acts of:

(A) applying an electrical discharge to vaporize a portion of the material to produce a plasma;

(B) detecting optical emissions emitted from the plasma;

(C) detecting x-rays fluoresced from the material; and

(D) classifying the material based on the detected x-rays and/or the detected optical emissions.

46. (New) The method claim 45, wherein a number of potential classifications are available, wherein the act (D) comprises:

(1) reducing the number of potential classifications by analyzing only a first one of two types of emissions: the detected x-rays or the desired detected optical emissions; and

(2) selecting one of the reduced number of classifications by analyzing only a second one of the two types of emission that was not analyzed in the act (D)(1).

47. (New) The method of claim 45 wherein the act (D) includes:

(1) creating one or more emissions spectra from the detected x-rays and detected optical emissions; and

(2) estimating peak values for one or more reasons of interest of the one or more spectra.

48. (New) The method of claim 45, wherein the material is part of a moving stream of materials, further comprising acts of:

(E) based on the classification, sorting the material by removing the material from the stream to a location associated with the classification,

wherein the acts (A) – (D) are performed as the material is moving.

49. (New) The method of claim 45, wherein at least a portion of the material is in liquid or molten form.

50. (New) The method of claim 45, wherein at least a portion of the material is in solid form.

51. (New) The method of claim 45, wherein the material comprises a plurality of pieces of material in solid form, and the acts (A) – (E) are performed on a plurality of pieces.

52. (New) The method of claim 45, wherein the act (D) comprises identifying a contaminant in the material.

53. (New) A method of automated sorting of material in a stream of materials presented for sorting, comprising acts of:

(A) detecting x-rays fluoresced from the material as it moves;

(B) detecting optical emissions emitted from a plasma resulting from a vaporization of a portion of the material as it moves;

(C) classifying the material based on at least one of: the detected x-rays, and the detected optical emissions; and

(D) based on the classification, sorting the material by removing the material from the stream to a location associated with the classification.

54. (New) The method of claim 53, wherein the act (A) comprises conveying the material at a rate of at least one foot per second.

55. (New) The method of claim 53, wherein the acts (A)-(D) are performed on materials of varying shapes and sizes.

56. (New) The method of claim 53, wherein the acts (A), (B) and (C) are performed in less then one second.

57. (New) The method of claim 53, wherein the act (D) comprises:

(1) creating one or more emissions spectra from the detected x-rays and the detected optical emissions; and

(2) estimating peak values for one or more regions of interest of the one or more spectra.

58. (New) The method of claim 53, wherein at least a portion of the material is in liquid or molten form.

59. (New) The method of claim 53, wherein at least a portion of the material is in solid form.

60. (New) The method of claim 53, wherein the material comprises a plurality of pieces of material in solid form, and the acts (A) – (E) are performed on the plurality of materials.

61. (New) The method of claim 53, wherein the act (D) comprises identifying a contaminant in the material.